GE Healthcare

Portascan

Portable Bladder Scanner

Service Manual

imagination at work

Portascan Service and Assembly Manual
MAN-004-049
Issue 1

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About this manual

Chapter 1. Introduction

This service manual can be used to service the Portascan at board level. The manual explains the functioning of the boards by means of functional block diagrams and photographs while connections can be checked at the connector overview. Preventative and corrective maintenance is also included as are circuit diagrams.

Warnings

Chapter 2. Warnings and Precautions

- A probe may only be connected to or disconnected from the scanner while the instrument is switched off. Ignoring this may cause severe damage to your scanner and/or probe.
- To avoid a risk of explosion the equipment must not be operated in the presence of flammable anaesthetics.
- To avoid a risk of electric shock do not open the equipment. Refer servicing to qualified personnel only.
- Be careful not to place the patient into contact with the ultrasound equipment or other devices. If the ultrasound equipment or other devices are defective, there is a risk of electrical shock.
- For continued protection against fire hazard, replace fuses only with the same type and rating.
- The use of non-Mediwatch Plc components with this scanner may result in damage to Mediwatch Plc components.
- To prevent hazards; refer to your local requirements for adequate electrical installation in case of class 1 type BF equipment.
- Do not subject the equipment to excessive shock, for example, when moving the equipment. If the equipment is repeatedly subjected to excessive shock, mechanical parts may be damaged.
- Assembly operations, extensions, re-adjustments, modifications or repairs must be carried out by authorized persons.
- The electrical installation of the relevant room must comply with the IEC requirements.
- The product must be used in accordance with the instructions for use.

Precautions

- Cleaning the probe is done by first removing the ultrasound coupling gel with a soft tissue and then gently wipe the probe dry using a new tissue or dry cloth.
- When more cleaning is required only a mild detergent or hand-soap may be used together with some water and a soft tissue cloth.
- To avoid possible damage, the probe cable must not be coiled to a diameter of less than 9 cm (3.5 inch).
- Although there is no danger to a patient with an implantable pulse generator (IPG); ultrasonic scanning equipment could cause mechanical damage to the IPG if used directly over the device's implant site.
- Do not use the equipment in locations subject to intense electric or magnetic fields (near transformers, for example). If the equipment is used in such locations, the monitor will be adversely affected.
- Do not use the equipment near devices generating high frequencies (such as medical telemeters and cordless telephones). If used near such devices, the equipment may malfunction or adversely affect such devices.
- To guarantee proper unit operation; do not operate the scanner in an environment with a temperature in excess of 35 °C. If the equipment is used in a small room, the room temperature may rise. Proper ventilation must be provided.
- Avoid installation near a heater or in direct sunlight.
- For correct image geometry, only monitors properly adjusted by the manufacturer may be used on the scanner.
- Inspect the probe carefully after a drop. A dangerous situation may arise due to damaged insulation of the probe surface.
- To prevent damage to mechanical probes due to excessive heat, a warning mechanism has been built into the system.

Chapter 3. Technical Specifications of the Scanner

General Specifications:

Power Input	10 - 13.5 Vdc
Power Consumption	12 VA
Scanning Method	Mechanical Sector
Display Modes	B - mode
Probe Frequency	3.5/5.0 MHz
Max Image Depth	20 cm
Scan Converter	Full Digital 512 x 512 x 8
Bladder Volume	0 -1500 ml
Accuracy	0 - 699 ml ± 20%, ± 20ml (whichever is700 ml - 1500ml ± 25% ± 25ml greater)

Accuracy is based upon usage as per instructions and scanning a tissue equivalent phantom

Display Format	8 inch colour TFT LCD 640 x 480 pixels
Battery	12 Volt rechargeable at least 1.5 Hrs continuous operation from full charge.
Dimensions	WxDxH = 16 x13 x 13 cm
Weight	2540g without battery and probe3220g with battery and probe
Enclosure Leakage and Earth Leakage Current	Within specification for Class II type BF according to EN 60601 - 1
Environmental Operating Conditions	Temperature 8 - 40°C Humidity up to 90% (20°C)
General Storage Conditions	Temperature 0 - 50°C
Standards	EN 60601 - 1 & Class II, Type BF handheld equipment

Acoustic Output information for the 3.5/5.0 MHz Mechanical sector (410047):

Parameter:	**Mode**	**B W o max.**
P_	(MPa)	1.2
1spt	(mW.cm2)	2.8
System settings		5.0HMz Min. scan angle Min. scan depth
1p		53.8
(mm)		
Wpb6 (_1_)	(mm)	2.4
Prr	(KHz)	1708
Srr		
(Hz)		2.8
Output Beam Dimensions		520.6
Area		
(mm²)		
Ø,<	(mm),	19.35
(°)		
Fawf	(MHz)	3.2
Acoustic power up fraction		0
(%)		
Maximum Power		2.6
(mW)		
Iob		0.6
(mW/cm²)		
Power up mode		B
Initialisation mode		B
Acoustic output freeze		YES
L tt		7.29
(mm)		
Lts		CONTACT
(mm)		
Inclusive modes		B

Chapter 4. Connector overview

Connections:

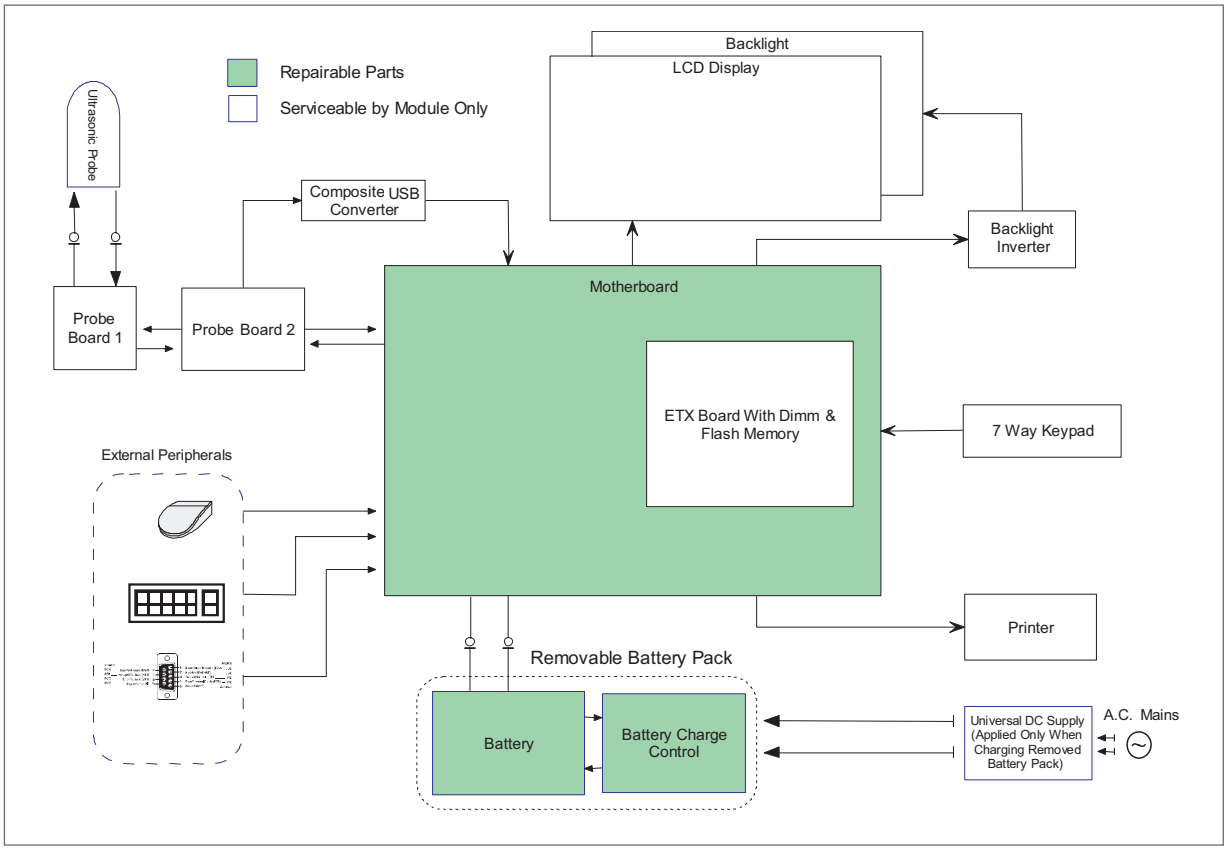


Figure 1. Portascan Block Diagram

EXT Board:

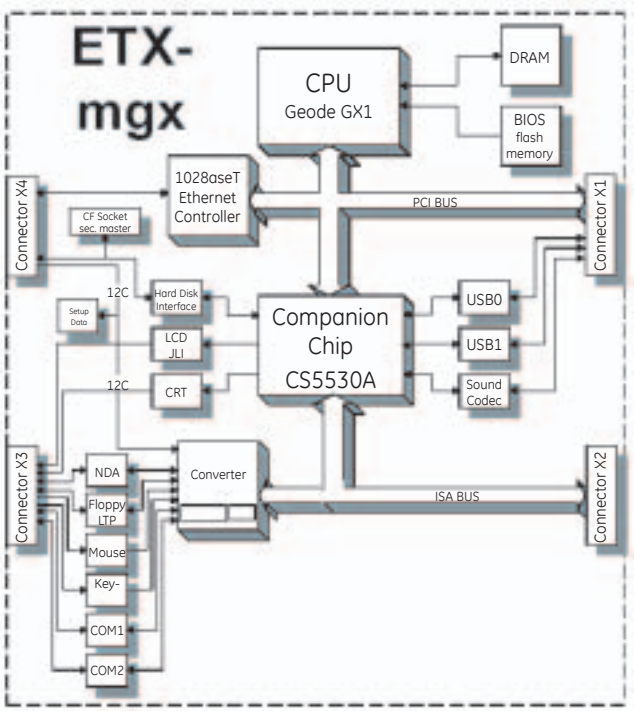


Figure 3. ETX Board Block Diagram

Main Board:

See **Main Board Schematic** for further details of connector Pin assignments.

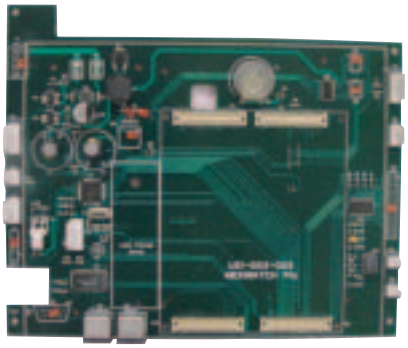


Figure 2. Mainboard Top View

Chapter 5. Planned Maintenance

Handling and Care

Although the scanner is produced with the utmost care and only the highest quality components are used, maintenance will be necessary from time to time to ensure trouble-free operation.

- Remove loose dust from the exterior with a soft cloth or a dry brush. A solution of water with a mild detergent may be used, but not freely applied. Avoid aggressive cleaners.
- Check the ventilation fans of the unit for proper operation.

Handling and Care probes

Basic precautions probes

Always follow these basic precautions:

- Inspect the probe daily for cracks and other damage.
- DO NOT use a probe that has been cracked or damaged.
- DO NOT use a probe that has been dropped or struck against another object until it is inspected by a service engineer.
- Avoid pinching or kinking the probe cable. If the probe housing becomes cracked or broken or if there are cuts or openings in the probe cable the electrical safety of the probe could be compromised.
- Disconnect the probe from the scanner before cleaning and disinfection. Make sure to switch the system off before disconnecting or connecting the probe.
- To prevent hazards; refer to your local requirements for adequate electrical installation in case of class 1 type BF

Agents and procedures that may damage the probes.

Some agents and procedures damage probes. Use of any of the following procedures or products WILL VOID your probe warranty.

Agents that contain the following chemicals are known to damage the probe:

- Acetone
- Methanol
- Denatured ethyl alcohol
- Mineral oil
- Iodine
- Any lotions or gels containing perfume. Check with the ultrasound gel manufacturer regarding gel contents. If you have additional questions, please contact your representative.

The following procedures are known to damage probes:

- Autoclaving
- Soaking the probe in chlorine bleach

General probe cleaning

Cleaning the probe is done by first removing the ultrasound coupling gel with a soft tissue and then gently wiping the probe dry using a new tissue or dry cloth. When more cleaning is required only a mild detergent or hand-soap may be used together with some water and a soft tissue cloth.

Chapter 6. Unit Disassembly

Figure 4. Portascan Top View

Figure 5. Portascan complete

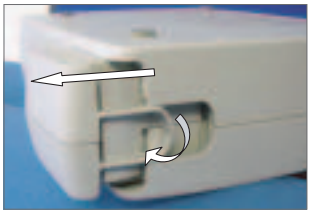


Figure 6. Battery release & removal

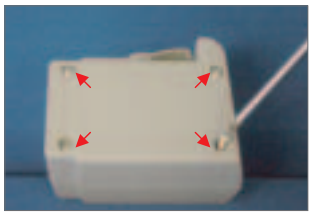
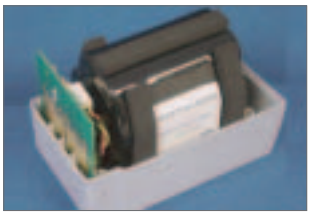


Figure 7. Unscrew 4 screws



& remove cover

Figure 8. Battery Pack & PCB Board

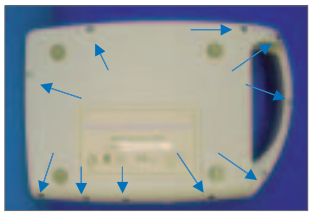


Figure 9. Back Panel with release screws arrowed

Figure 10. Note location of long screw

Figure 11. Probe connector lock nut

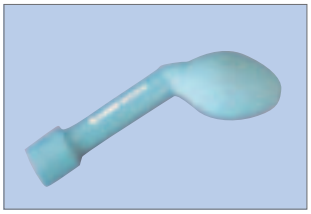


Figure 12. Use special Lemo wrench to loosen probe connector nut

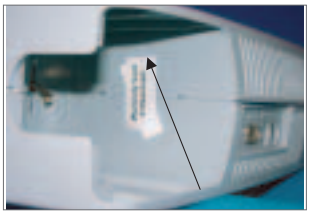


Figure 13. Cut or remove security sticker then hinge top away to separate case

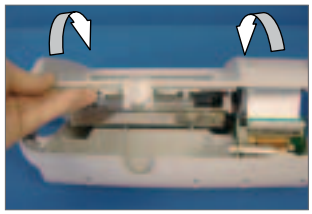


Figure 14. The bottom case and handle grip can be placed to one side

Figure 15. Two screws hold the main assembly in place

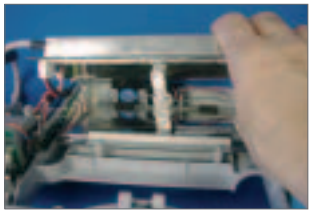


Figure 16. Lift main board peeling away earth strap & disconnect plugs/skts.

Figure 17. Note location of sounder & fan ... and display inverter board

Figure 18. Carefully turn over main panel.

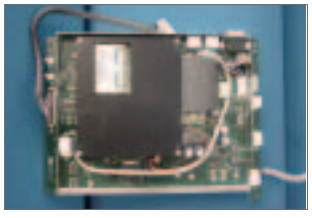
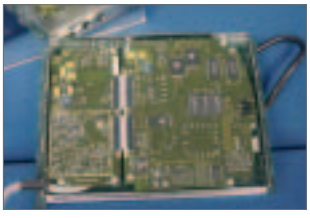


Figure 19. Shielding removed



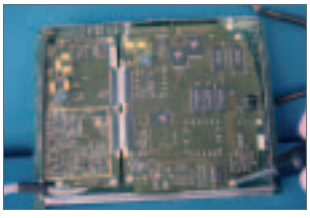


Figure 20. Probe interface panel set. Remove screws to separate

Chapter 6. Unit Disassembly - continued

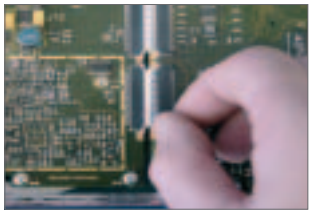
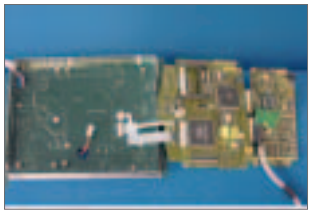


Figure 21. Separate ribbon connector, or carefully hinge probe interface boards



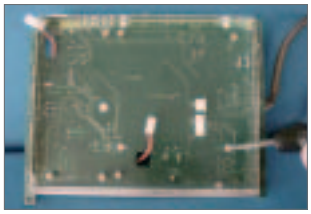
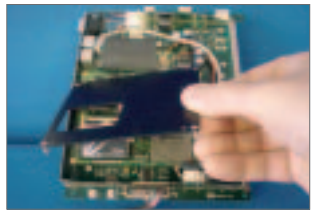


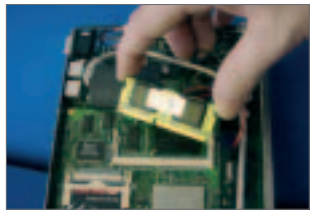
Figure 22. ... to reveal ETX Heatsink screws



Retain Heatsink from other side

Figure 23. The compact flash can now be removed, reprogrammed & replaced

Figure 24. 24 RAM can also be accessed if necessary (Observe E.S.D. precautions)



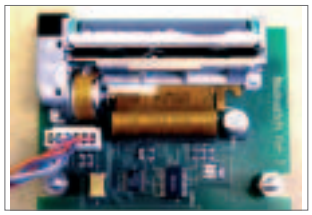


Figure 25. The compact flash can now be removed, reprogrammed & replaced

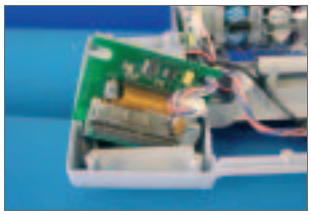
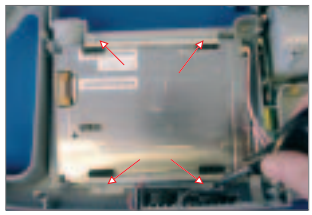
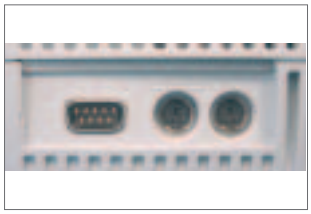


Figure 26. 24 RAM can also be accessed if necessary (Observe E.S.D. precautions)

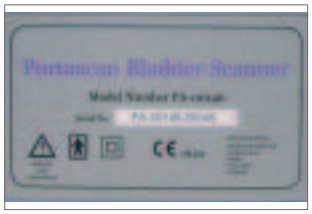


LCD mounting brackets & screws

Dual frequency probe & connector



Rear panel connections



Bottom case label

Keypad membrane

Chapter 7. Faults and Solutions

Screen Related

LCD blank, can be caused by loose connector at rear of display panel or faulty display.

LCD poor contrast or dark due to failure of inverter board P/N C-00049.

Probe Related

Probe knocking: generally caused by one or more broken wires at the back of probe socket.

Probe not scanning, error message probe too hot: Probe or probe interface board

Keypad Related

Led failure, internal led becomes detached possibly due to operator, replace keypad.

No response from keypad. Due either to connector failure or to short caused by poor etching of the keypad ribbon cable. Reconnect or replace keypad

Software Related

On the rare occasion that Windows 98SE crashes, the display will freeze and keypad will be inactive. In this situation the system will automatically shut down after 15 seconds. DO NOT remove the battery pack until this has happened. Removing the battery pack before complete shutdown could cause the following problems:

Unit boots into windows safe mode, connect external keyboard and follow screen prompts, if problem is not resolved after two or three reboot attempts then unit requires the compact flash to be reprogrammed.

Fatal exception error, run scandisk to establish integrity of compact flash using the ETX test assembly. If flash disk fails then replace and reprogram with latest version.

Boot error message writing to drive c, treat as per fatal exception error.

Chapter 8. Parts List

Parts Description	Mediwatch Code
Battery Cells	PSA00020
Battery Gold Contacts	PSA00021
Battery Pack	PA00141B
Battery Pack Case (Lower)	C00052A
Battery Pack Case (Upper)	C00051A
Battery PCB	PSA00052
Fan	C00068
Flash Memory 256Mb	C00169
Flexi-Links (Interface PCB-pair)	PSA00065
Frame Grabber PCB	C00165
Motherboard PCB	PSA 00042
ETX PCB	C00148
SDRAM 256Mb	C00168B
Interface PCB	PA00143A
Inverter Cable	C00049
Screening Cans	PSA00062
Keyboard Membrane	PSA00182
LCD Backlight Inverter	C00048
LCD Bracket(Bottom)	PSA00015
LCD Bracket(Top)	PSA00014
LCD Data Cable	PSA00017
LCD Screen	C00047
Lid	PSA00006A
Magnet Contact	PSA00061
Magnet Support Plates	PSA00060
Handle Soft Grip	PSA00011
Magnet(Print Lid)	C00216
Main Case(Lower)	C00037A
Main Case(Upper)	C00036A
Main Printer Lid	C00040A
Printer Bowl	C00041A
Printer Pcb Assy.	PSA00045
Probe 3.5/5.0Mhz	PA00143
Probe Connector Location Washer	PSA00072
Probe Connector Mounting Ring	PSA00064A
Battery Charger	PA00142B
Speaker	C00067
Thermal Print Unit	C00057

Chapter 9. ESD

What is ESD

Electro Static Discharge (ESD) is the transmission of electro static charges between two bodies with a potential difference. This transmission can be achieved by direct contact or by an inducted electrostatic field. Electro static discharges are not always noticed by operators, because ESD is:

- sensed at 3,500 Volt
- audible at 4,500 Volt
- visible at 5,000 Volt

Components and integrated circuits are more sensitive than operators and might be damaged by lower voltage discharges.

Component Type	ESD sensitivity in Volts
V-MOS	30-1800
mosFET	100-200
EPROM	100
JFET	140-7000
OP-AMP	190-2500
C-MOS	250-3000
Schottky Diodes	300-2000
Bipolar Transistors	380-7000
ECL	500-1500
SCR	680-1000
Schottky	TTL 1000-2500

Preventing ESD damage

Use electro static sensitive parts only in an ESD safe workshop.

- Use ESD safe packing material.
- Remove all static chargeable materials (plastics) from the workshop.
- Wear ESD safe clothing.
- Always check wrist strap and other ESD equipment before use.
- Be grounded.
- BE AWARE.

ESD safe workshop

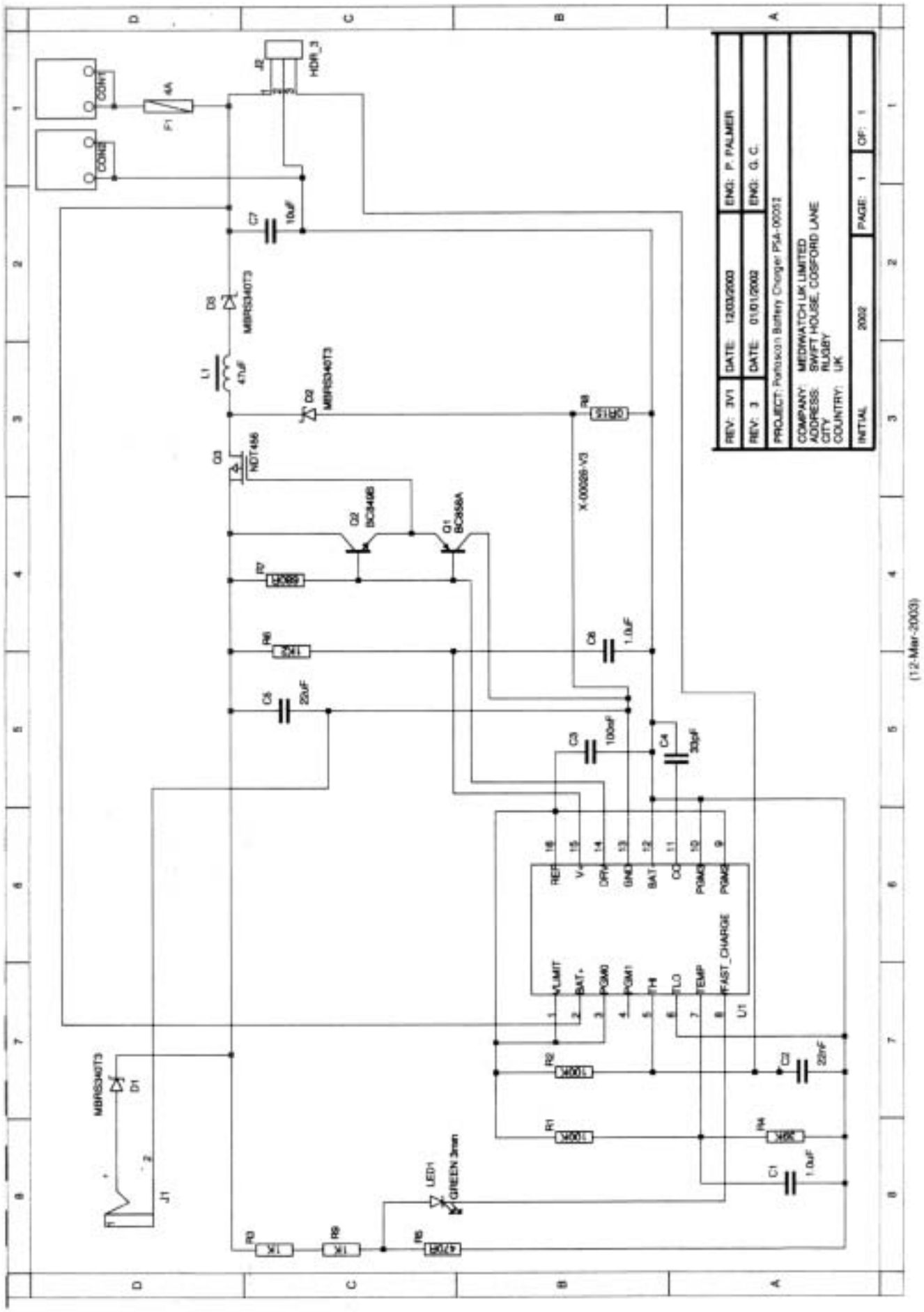
To be sure that there is no potential difference between body, boards and work surface, the work surface should be made of electrostatic dissipative rubber. The work surface should be connected to a central ground point. The engineer, handling the boards should also be connected to the central ground point, either through wrist strap or heal strap (and conductive floor).

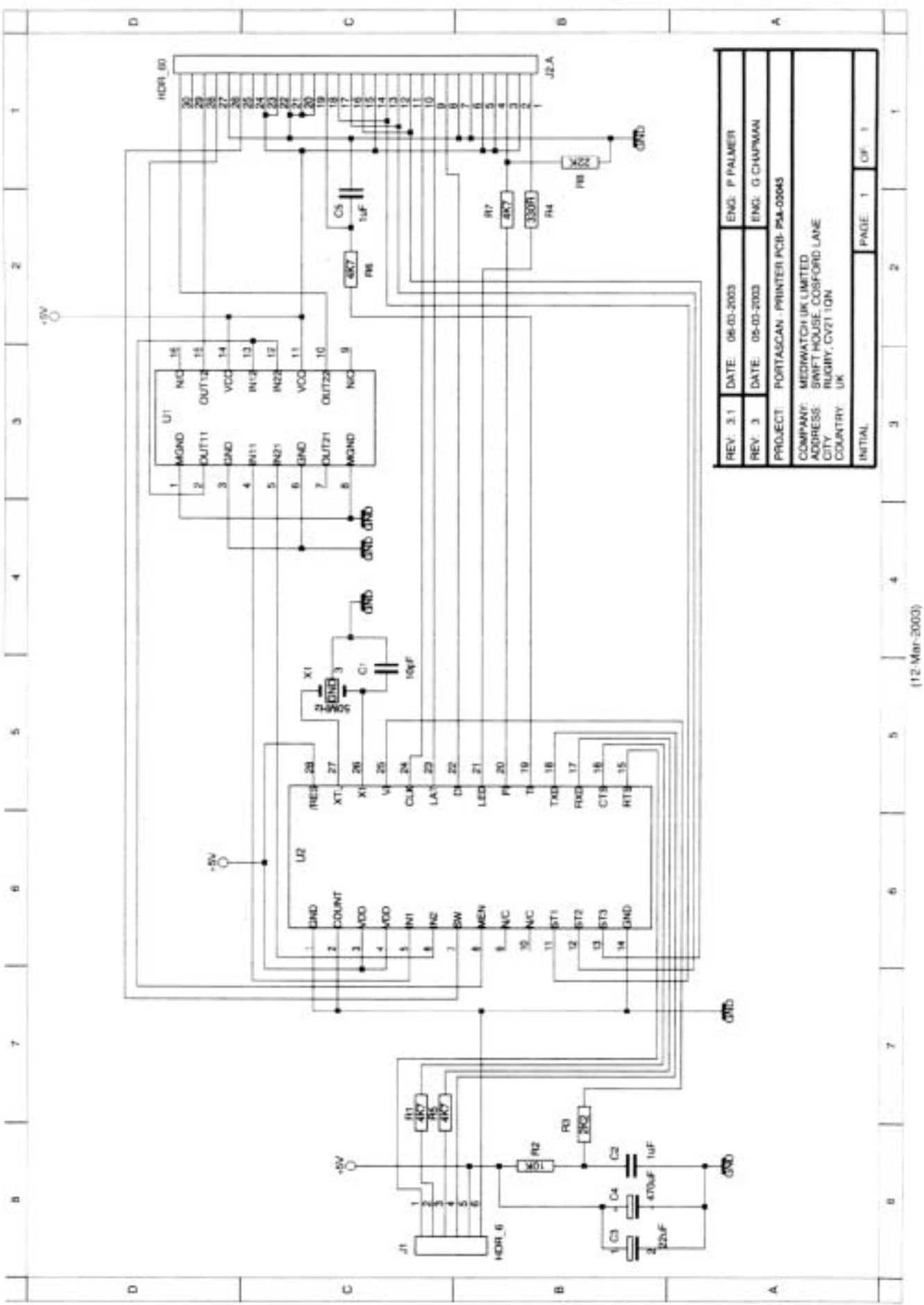
ESD safe field service

To enable ESD field safe service an ESD field service kit has to be used whenhandling boards.
This ESD field service kit should be connected to a central ground point and the service engineer should be connected to the ESD field service kit through a wrist strap.
Handle boards only on this ESD field service kit and pack in ESD safe packing material.

More information about ESD precautions

All precautions against ESD damage are described in the CECC 00015/I regulations, composed by the CECC - Cenelec electronic Components Committee.


REV: 3V1
DATE: 12/03/2003
ENG: P. PALMER
REV: 3
DATE: 01/01/2002
ENG: G. C.
PROJECT: Portascan Battery Charger PSA-00051
COMPANY: MEDIWATCH UK LIMITED
ADDRESS: SWIFT HOUSE, COSFORD LANE
CITY RUGBY
COUNTRY: UK
INITIAL 2002
PAGE: 1
OF: 1
(12-Mar-2003)
X-00026-V3
U1
J1
J2
HDR_3
F1
4A
CON1
CON2
C7
10uF
D3
MBRS340T3
L1
47uF
D2
MBRS340T3
R8
910R
Q3
NDT456
Q2
BC846B
Q1
BC858A
R7
120R
R6
22R
C6
1.0uF
C5
22uF
C3
100nF
C4
33pF
REF
VI
DRV
GND
BAT
CO
PGM2
PGM3
VLIMIT
BAT+
PGM0
PGM1
TH
TLO
TEMP
FAST_CHARGE
R2
1K001
R1
1K001
C2
22nF
R4
49R
C1
1.0uF
D1
MBRS340T3
LED1
GREEN 3mm
R3
1K
R9
1K
R5
150R47


REV: 3.1
DATE: 06-03-2003
ENG: P PALMER
REV: 3
DATE: 05-03-2003
ENG: G CHAPMAN
PROJECT: PORTASCAN : PRINTER PCB- P34-00045
COMPANY: MEDIWATCH UK LIMITED
ADDRESS: SWIFT HOUSE, COSFORD LANE
CITY: RUGBY, CV21 1QN
COUNTRY: UK
INITIAL
PAGE: 1
OF: 1
(12-Mar-2003)

Appendix 1

Testing of Final Assembly

Scanner Serial No:
Interface Board Serial No:
Probe Serial No:

Instructions:	Pass / fail:
Insert a charged 'test' battery pack and check that it fits securely.	
Ensure that the printer door opens and closes smoothly and that the magnetic latch holds the door securely when the door is closed.	
Restrain paper and shake unit and ensure that there are no loose parts inside.	
Unplug the probe from the unit by pulling on the release ring on the plug and ensure that there is no damage to the connector on the unit or the probe plug. Plug the probe in and check that it clicks securely in place.	
Plug a standard PC keyboard into the appropriate socket on the back of the unit. Switch the unit on by pressing the red power button & wait for the unit to start up. Hold down 'Alt'& 'Shift'& 'Control' then press 'W' very briefly to disable the Interface board watchdog timer. Switch off by pressing the red button and wait for the unit to power down.	
Remove the keyboard and switch the unit back on by pressing the red button. Wait for the unit to start up.	
Press the display brightness button several times and ensure that the display brightness toggles between its high and low setting.	
Press the menu button and check that the menu options are displayed.	
Using the "UP", "DOWN" menu buttons select the "Date/Time" option and then press the "SELECT" button. Press the "SELECT" button again to select the "Set Date" option. Check that the correct date is displayed. If the incorrect date is displayed then set the correct date by using the "UP", "DOWN" and "TAB" menu buttons and lock the setting by pressing the "SELECT" button.	
Press the menu button. Using the "UP", "DOWN" menu buttons select the "Date/Time" option and then press the "SELECT" button. Press the "DOWN" button and then the "SELECT" button to select the "Set Time" option. Check that the correct time is displayed. If the incorrect time is displayed then set the correct time by using the "UP", "DOWN" and "TAB" menu buttons and lock the setting by pressing the "SELECT" button.	
Press the menu button. Using the "UP", "DOWN" menu buttons select the "Set Probe Frequency" option and then press the "SELECT" button. Press the "DOWN" button and then the "SELECT" button to select the "5Mhz" option. The unit will switch to 5Mhz operation and "5Mhz" will be displayed at the top of the display.	
Press the green button to start scanning. Align the probe on a phantom bladder so the largest section of the phantom can be seen on the display. Press the magnification button repeatedly so that the unit cycles through all levels of magnification then set the magnification so that the phantom fills the display but does not overlap the edges of the scan sector.	
Press the green scan button to record the reading. Check that the reading is within tolerance (+ or - 10% of indicated phantom volume).	
Press the print button to obtain a hard copy of the result.	
Press the sagittal scan button and rotate the probe 90 degrees from the position of the first scan and obtain the largest section and press the sagittal scan button again to obtain the reading.	

Appendix 1

Testing of Final Assembly - continued

Instructions:	Pass / fail:
Press the print button to obtain a hard copy of the result.	
Press the menu button. Using the "UP", "DOWN" menu buttons select the "Set Probe Frequency" option and then press the "SELECT" button. Press the "DOWN" button and then the "SELECT" button to select the "3.5Mhz" option. The unit will switch to 3.5Mhz operation and "3.5Mhz" will be displayed at the top of the display.	
Press the green button to start scanning. Align the probe on a phantom bladder so the largest section of the phantom can be seen on the display. Press the magnification button repeatedly so that the unit cycles through all levels of magnification then set the magnification so that the phantom fills the display but dose not overlap the edges of the scan sector.	
Press the print button to obtain a hard copy of the result.	
Press the sagittal scan button and rotate the probe 90 degrees from the position of the first scan and obtain the largest section and press the sagittal scan button again to obtain the reading.	
Press the print button to obtain a hard copy of the result.	
On the printed results record in the field "Patient Name" the serial number of the unit that is being inspected.	
Open the printer door and raise the print head and remove the paper. Feed the paper back into the printer until the end appears from the front paper slot and re-engage the print head.	
Press the print button. The last recorded image should be printed.	
Leave the unit sitting for 5 minutes in which time the display should have shut down. (If the unit is left for longer than 7 minutes the unit will switch off and the test will need to be repeated in order to proceed to the next step).	
Press any function button to reactivate the display.	
Press the red power button. The unit will now shutdown and switch off. Remove the battery pack. Fit the top cover with protective polythene.	
Ensure that the top cover opens and closes smoothly and that the latch holds the cover securely in place when closed. Ensure that the friction latch holds it from falling forward when fully opened.	
Check that the Power drawn by the Battery when the unit is powered down is less than 10mA.	

This Bladder scanner has PASSED/FAILED the above Test Procedure.

(Delete as appropriate)

Signed: _____. Date: ____/____/_____

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